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PATENT
DOCKET NO. 1177-9

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICANT: Eilaz Babaev

EXAMINER: Shawna J. Shaw

SERIAL NO.: 09/774,145

ART UNIT: 3737

FILED: January 30, 2001

FOR: ULTRASONIC WOUND TREATMENT METHOD AND DEVICE USING STANDING WAVES

P.O. Box 1450
Commissioner for Patents
Alexandria, VA 22313-1450

DECLARATION UNDER 37 C.F.R. SECTION 1.132

I, Eilaz Babaev, declare and say:

That I am a citizen of the United States of America and that I reside at 4583 Wilson Street, Minnetonka, MN, 55345.

That I am the inventor of the above-identified patent application.

That I was conferred degrees as described in detail in the attached resume.

That since 1965 I have been working in the field of ultrasound technology as described in detail in the attached resume.

CERTIFICATION UNDER 37 C.F.R. § 1.8(a)

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail, postpaid in an envelope, addressed to P.O. Box 1450, Commissioner for Patents, Alexandria, VA 22313-1450.

Dated: January 31, 2005

Adrienne Fagan

Adrienne Fagan

That I have been granted eleven U.S. patents and thirty three non-public domain USSR patents in the ultrasonic technology field, and I am the author of more than fifty scientific and/or technological papers in the ultrasonic technology field.

That I am familiar with the above-identified patent application Serial No. 09/774,145. I have read and understood the Examiner's rejection of Claims 1-3, 6, 9-11, and 19-29 under 35 U.S.C. § 112 first paragraph.

That I have observed that standing waves created between a distal end of an ultrasonic transducer and a wound create radiation pressure when the distal end of the ultrasonic transducer is positioned at a non-contact distance from the wound. The non-contact distance is adjusted for creating and maintaining the standing waves. The non-contact distance is determined by the formula $n \times \lambda/2$, where λ is the wavelength of an ultrasound standing wave and n is a positive integer. The radiation pressure provides bactericidal and therapeutic effects which result in a decrease in the healing time of a wound. The bactericidal and therapeutic effects which result in a decrease in the healing time of the wound are intrinsic to application of ultrasonic standing waves.

That ultrasonic energy is deliverable to a wound through a gaseous medium, such as pure air, for achieving a therapeutic effect at the wound, as described in U.S. Patent No. 6,761,729 issued to myself and assigned to Advanced Medical Applications, Inc. Specifically, column 6, lines 8-56 and FIG. 6 show and describe delivery to a wound of ultrasonic energy through a gaseous medium for achieving a therapeutic effect at the wound.

That ultrasonic standing waves are known to physiologically and morphologically affect organisms, such as yeast cells. See, for example, the accompanying articles entitled, "Viability of Yeast Cells in Well Controlled Propagating and Standing Ultrasonic Plane Waves," Radel et al., *Ultrasonics*, vol. 38, pages 633-637, 2000 (describing controlling the spatial

organization of yeast cells (bacteria) using both standing and propagating ultrasonic waves); and "Breakdown of Immobilisation/Separation and Morphology Changes of Yeast Suspended in Water-Rich Ethanol Mixtures Exposed to Ultrasonic Plane Standing Waves," Radel et al., *Bioseparation*, vol. 9, pages 369-377, 2001 (describing physiological/morphological changes of suspended yeasts when exposed to well-defined ultrasonic standing waves, as well as propagating ultrasonic waves). These articles were previously submitted along with an Amendment filed under 37 C.F.R. § 1.111 on November 21, 2003 in response to an Office Action.

That drugs can be successfully penetrated through the surface of the wound using ultrasound standing waves. See, for example, the accompanying articles entitled, "Ultrasound-Mediated Transdermal Protein Delivery," Mitragotri et al., *Science*, vol. 269, pages 850-853, August 11, 1995 (describing the penetration of proteins through the human skin using low-frequency ultrasound); and "Transdermal Delivery of Insulin by Ultrasonic Vibration," Tachibana et al., *J. Pharm. Pharmacol.*, vol. 43, pages 270-271, April 1991 (describing the penetration of insulin through the skin of hairless mice using ultrasonic vibration). These articles were previously submitted in an Amendment under 37 C.F.R. § 1.111 on November 21, 2003 in response to an Office Action.

That therapeutic and bactericidal effects have been achieved by me when devising an ultrasonic wound treatment method and device using standing waves employed in the invention described and claimed in the above-identified patent application.

That in accordance with the invention, ultrasonic standing waves are created between radiation surface of ultrasound transducer and a wound through the air and/or liquid spray-mist to effect an increase in blood flow, kill bacteria, stimulate healthy tissue cells, and treat wounds with ultrasonic energy.

That the results of tests described in "Breakdown of Immobilisation/ Separation and Morphology Changes of Yeast Suspended in Water-Rich Ethanol Mixtures Exposed to Ultrasonic Plane Standing Waves," Radel et al., are summarized in Tables 1 and 2 of the same paper; tests described in "Viability of Yeast Cells in Well Controlled Propagating and Standing Ultrasonic Plane Waves," Radel et al., are summarized in Fig. 5 of the same paper; tests described in "Ultrasound-Mediated Transdermal Protein Delivery," Mitragotri et al., are summarized in Figs. 1A-B and Figs. 2A-D of the same paper; the results of tests described in "Transdermal Delivery of Insulin by Ultrasonic Vibration," Tachibana et al., are summarized in Fig. 1 of the same paper.

That the above tests demonstrate clearly the enablement of the device and method employed in the invention described and claimed in the above-identified patent application. That the undersigned declares further that all statements made herein of his own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Respectfully submitted,

Dated: 01-27-05

Eilaz Babaev, Ph.D, D.Sc.

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ELIAZ (ELIAZ) P. BABAEV, Ph.D., D.Sc.

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CAREER PROFILE

Recognized technical and business leader in advanced ultrasound technologies able to direct R&D organizations and new technology start-up companies. Proven strengths in building strong organizations around practical new business initiatives. Experienced in forming strategic corporate technical and commercial partnerships to facilitate effective market introduction of new products. Recognized leader and expert in Intellectual Property Protection for companies. Selected areas of expertise include:

- Biomedical/Biomechanical Systems and Device Engineering
- Non imaging Medical Applications of Advanced Ultrasound Technology
- Medical and Agricultural Ultrasound Sterilization Technologies

PROFESSIONAL EXPERIENCE

Celleration, Inc., Eden Prairie, MN **1999 – present**

Celleration is a start-up company developing novel ultrasound technology and system used in wound treatment therapy, based on Dr. Babaev's unique and patented ultrasonic technology, which has been cleared by FDA.

CEO (1999- 11/01/2001), Chief Technical Officer (1999 – present)

- Full responsibility for the corporate strategic, business, and engineering management.
- Hands-on participation in the design and rapid prototyping of ultrasonic devices for wound treatment.
- Managed development of new ultrasonic system and disposable applicator/fixture designs, including characterization of acoustical parameters - impedance, intensity, frequency, and amplitude control.
- Supervised completion of all technical documents.
- Coordinated and conducted clinical and laboratory/animal research at the Mayo Clinic, North Carolina University Medical School and West Ontario Medical School in London, Canada. Investigated influence of ultrasound waves to bacteria cells such as St. aureus, Ps. Aeruginosa, MRSA, VRE, etc.
- Created and filed 15 US patent applications. Sole authorship of Celleration core technology based on already received 9 US patents.

DiaSorin, Inc., Stillwater, Minnesota **1998 – 1999**

DiaSorin is an immunoassay systems and device manufacturing company

Ultrasound System Design Engineer

- Designed, calculated, tested, and validated dispensing ultrasonic system for a new generation of immunoassay system. Computer patent search and a patent submission related to the control of the acoustical system output. One US patent issued.
- Improved performance of sonication system used in an existing product. Worked on characterization of ultrasonic dispersion systems. Involved in product quoting, material evaluation and selection, troubleshooting, and productivity and process improvement.

SpectRx, Atlanta, Georgia **1997 – 1998**

SpectRx is a biophotonic device and diabetic care company.

Principal Research Scientist, Transdermal Drug Delivery Systems Department

- Managed a staff of four engineers to develop ultrasonic, minimally invasive, bloodless and painless sampling and treatment methods and devices for patient use. Production was compliant with FDA GMP and ISO 9000 guidelines.
- Responsible for design of ultrasound wave-guides, design of surgical and ultrasonic heavy molecules milli - and micro-liter drug delivery systems for insulin, peptide, and protein based drugs.
- Conducted laboratory and in-vivo clinic testing for developed instruments. Prepared and delivered presentations and quarterly reports to company clients.

Areopag is a technology transfer company.

Biomedical Engineering Project Leader

- Responsible for research, design, development, testing and validation of new acoustic devices and systems. Designed ultrasound transducers, fixtures, and accessories.
- Performed calculation and measurement of sound and vibration parameters (acoustic pressure, frequency, amplitude, etc.) and stress/strain analysis.
- Investigated influence of ultrasound waves to the industrial bacteria cells. Patented a method and a system for solving environmental wastewater sterilization problem.

State Technical University, Baku, Azerbaijan **1969 – 1994**

Assistant Professor (1969-1975), Associate Professor (1975- 1991), Full Professor (1991-1994)

- Teaching and research activities: Supervised graduate and Ph.D. students.

Director, Biomedical Engineering Center at State Technical University **1975 – 1994**

- Managed research and development in bioengineering.
- Studied physical and mechanical properties of metals, plastics, composite materials, hard and soft biological tissues-over 10,000 experimental measurements (human and animal), strain and stress in the different bones, electrical potentials in biological tissues in order to design and develop new medical devices, instruments, prosthesis and implants.
- Researched, designed, developed and clinically tested new medical devices, disposable medical products, surgical instruments, orthopedic implantable and non-implantable products, new wound (open and closed) healing devices, ultrasound drug delivery (transdermal, contact, noncontact, invasive, noninvasive, catheter, continuous, pulsed, nano, micro, milli and picoliter volumes, etc.) systems and different kinds of ultrasound mixers for liquids.
- Studied influence of ultrasound waves on healthy biological tissues, different kind of microbe cells (up to 10) and infected wounds by SEM. Researched influence of ultrasound waves on polymers such as ethyl alpha cyan acrilate in order to create new medical devices.
- Researched acoustical properties of different biological tissues and influence of wide range of ultrasound waves to the different human and animal tissue such as bones, blood vessels, cartridges, mussels, hairs, etc.
- Researched the influence of different energy sources such as ultrasound, electrical, laser, magnet, UV, RF, and combinations on human tissue (healthy and diseased) and bacteria cells in order to create new bioengineering technologies.
- Researched, designed, developed and tested in animal laboratory new vaccine creation technology
- Researched influence of ultrasound waves on plants, animals for different purposes such as increase weight, productivity, avoid disease, etc.
- Consulted for medical device manufacturing companies in product development and troubleshooting. Worked with plant staff to eliminate existing defects and to increase productivity.
- Created, filed and granted 33 Soviet patents.
- **Certified Patent and Trademark examiner for Patent and Trademark office of Republic of Azerbaijan 1988 –1994 (Registration ID # 10)**

EDUCATION

D.Sc. (Doctor of Technical Science) in Biomedical Engineering (Therapy Ultrasound). State Supreme Certification Committee, Moscow, Russia. 1993.

D.Sc. (Doctor of Technical Science) in Biomedical Systems (Medical Ultrasound). Latvia State Academy of Science, Riga, Latvia. 1991.

Training Course in the International Patent Law. (Intellectual Property Protection/litigation) State Patent and Trademark Office Branch at Bauman Technical University, Moscow, Russia. 1973 – 1975.

Ph.D. in Biomedical Engineering (Medical Ultrasound). Bauman Technical University, Moscow, Russia. 1972-1975.

B.S./M.S. Degree (integrated) in Mechanical Engineering, Industrial Ultrasound (NDT), State Technical University, Baku, Azerbaijan. 1964 – 1969.

PATENTS AND PUBLICATIONS

Complete List of Publications consists of 11 US-Patents, 33 USSR-Patents and over 50 Scientific Papers